1 Introduction

This is a summary of some notes I've collected on using Gregorio, an open-source project which 'aims at providing tools and documentation for Gregorian chant' (website blurb). Here I focus only on a subset of features of the `gabc` and `GregorioTeX` formats, specifically on how to use Gregorio to typeset scores in chant notation. The entire project is more extensive, and I'd encourage reading the project website or contacting the developer for more information.

2 Installation

Most of these notes assume you have a working copy of a recent revision of Gregorio from the project repository. To get one, do an svn checkout:

```
svn co svn://svn.gna.org/svn/gregorio/trunk
```

These are not meant to be extensive installation notes, but on a Debian-based system, if you have/get `dpkg-dev` and `fakeroot`, you can build the `.deb` packages yourself by typing `dpkg-buildpackage -rfakeroot` in the root directory. **Note:** Ubuntu Hardy (and earlier versions) include a more outdated version of `debhelper` than this package is expecting. If you don't update, you'll need to change a file or two in `/debian` to get it to work. It's trivial; changing a version number if I remember correctly. This process should also inform you of missing dependencies(?), and will create two packages in the parent directory. These can be installed with

```
sudo dpkg -i gregorio*.deb
```

in that directory, which will install the Gregorio program and its fonts, also putting all the necessary files in their proper place in your TEX distribution, and making all the adjustments for TEX to be happy... That is an incredibly useful thing, especially since everyone else will have to update their TEX distributions themselves, a process which is less than fun.

In Mac OS X, or non-Debian based Linux systems, you will need to run (inside the project's `trunk` directory)

```
autoreconf --install -f
./configure
make
sudo make install
```

And then move all font and TEX-specific files to someplace your TEX distribution will find them (on your texpath). You will also need to update your TEX `.map` files so TEX knows where to find the new fonts. The documentation on how to manually update your TEX distribution with new fonts is available various places online, usually written somewhat poorly... There is also a brief description of what you need to do in `/fonts/INSTALL`. You can email me if you need help with that, it's all a little confusing especially if this is your first foray into TEX world...

Under Windows, you need cygwin... and then after Gregorio's installed you need to do a manual TEX update too.

3 Basic Usage

After installation, Gregorio will be available to you from the command line. So when you've typed up a .gabc file in your favorite plain text editor, parse it with Gregorio:

```
gregorio chantfile.gabc
```

The default conversion, going from a .gabc file you've typed to a GregorioTeX file, is probably what you'll use the most.
Some command line options are (full list can be found by typing `gregorio` at your shell prompt)

- `-o file` : writes output to user-specified file; the default keeps the same name and only changes the extension
- `-F format` : specifies format of output file; if unused default format is GregorioTeX. Gregorio can also write to OpusTeX and GregorioXML.
- `-f format` : specifies format of input file; if unused format gabc is assumed

Example: `gregorio -o requiemIntroit.tex requiemAeternam.gabc`
This reads your chantfile called requiemAeternam, and writes a GregorioTeX file of the score to a newfile called requiemIntroit.tex. This file includes all the layout information about the chant notation you've created, including fonts, precise syllable alignments, etc. You probably want to see what the score looks like though, so how do you actually view that...Create a main file to format the score however you wish, convert the TEX file using `lamed`, and finally convert to pdf. Slightly more detailed...

1. Create a main wrapper file (ex. `main.tex`). This is probably easiest to write in LATEX, and Gregorio includes an example as `main-lamed.tex` in `trunk/examples`. It can be quite empty... especially if all you need is a single page of a chant. The main thing is that you include the gregoriotex files – if using LATEX the macro `\usepackage{gregorio}` takes care of everything – and include your score `\includescore{requiemIntroit.tex}`. It can also be more complex, for example if you wish to design a handout with multiple scores and text sections included (I have more examples of that, if you wish).
2. Invoke `lamed` on the main file `lamed main.tex` . This converts to dvi. You probably don't want to look at that file.
3. Invoke `dvipdf` on the dvi file `dvipdf main.dvi` . This creates a final pdf which you can view to your heart's content.

Note that if you wish, steps 2 and 3 can be combined in a basic script. You can set some TEX editors to combine these steps as well. On the offchance you're on a Mac, I can help set up TeXShop (the editor that is included with MacTeX) so that there's a one-button process to generate the score from your `main.tex` file. The built-in pdf viewer will then pop up with your score on screen. Easy!

4 Entering the .gabc file

These are some notes on how to write a score in gabc format. The minimum required format is

```
name:x;
%%
your score here
```

A more complete list of header information you may wish to include after the `name:` attribute is at the gregorio project website.

4.1 Some basic information first

Entering chant information in Gregorio is a bit different than most other chant input methods, at least that I've seen. For example, in OpusTeX, each place on the staff is labelled differently, depending on where the clef is located. Also, the neumes are specified by name, theoretically by you, the type-setter (I guess that's one way to help remember which neume is which). To make it easier, Gregorio labels each place on the staff in a consistent manner, using letters of the alphabet; details are below. Also, since Gregorio is based on `Omega`, which in turn is based on LaTeX, it is able to compute end-of-lines for you (sometimes you will have to override its choices; you can't have everything). This also allows it to set the custos at the end of the line and clefs at the beginning of the next line automatically. Finally, Gregorio will also hyphenate between syllables of words when necessary, and recognize vowels in your chant score, centering them correctly under the notes. Using Gregorio should be fast! As a potential drawback, there is no gui (yet), so you can't really visualize your score as you enter it.

4.2 A brief summary of .gabc input

I will try to briefly discuss how to enter a chant in `.gabc` notation. Gregorio's website includes a page with much of this, and it's probably written more clearly, including pictures which are helpful, so this is **only** a recap.

The `.gabc` file is just a text file, in which the chant's notation is represented with various letters and signs. All notational information is written inside parentheses, between syllables of the chant, and spaces are used to mark the end of words, just as they are in normal writing. Each pitch, or place on the staff, is signified by a single lowercase letter, running from `a-m`. 'a' is the bottom-most note you can have in a score (the note below the bottom ledger line). This makes the actual bottom staffline 'd'; continuing up the staff, the second staff space is represented with 'g', and so forth.

To begin a score, you first define the initial clef. The clef is defined by naming it with `c` for do-clef or `f` for fa-clef, as appropriate, followed by the number of the line on which the clef appears `1-4` (counting from the bottom of the staff.) Ex. `(c4)` marks that a do-clef is on the top line, and this will continue throughout your score.

Now we get into the actual chant score. For each syllable of the chant, you can specify the pitches that should be sung. Gregorio will parse these notes, attempting to create correct multi-

note neumes automatically. So for example, you do not need to worry about inputting a torculus differently from a porrectus; you just input which three notes are sung, in order, (ex. `(ghg)` or `(geg)`) and gregorio interprets, drawing the correct shape. Here is some basic notation:

- `a-m` : generic note (a punctum when used alone; groups of these automatically form into larger neumes as appropriate)
- `A-M` : use upper case for diamond-shaped notes, never used alone...
- `v` : virga; to use, place *after* the note.
  Example: `(ivHG)` creates a climacus, descending from the third space of the staff.
- `w` : changes the note to a quilisma.
  Example: `(hw)`
- `x` : places a flat. It should be called following the letter that names where it appears on the staff. Note this only places the flat itself, you still need to write the note as usual.
  Example: `(ixi)` puts a flat on the third space, and the punctum which it modifies.
- `y` : places a natural. Usage is same as above.
- `.` : dot; unsurprisingly, a dot after a note. Can be used successively, e.g.`(gf..)` is a dotted clivis.
- `'` : ictus. Marked after the note on which it is placed. Example: `(h')`
- `_` : episema. If it extends for longer than one note, it can be marked after each note, or at the end of the entire group.
  Example: `(ghg___)` and `(g_h_g_)` produce the same thing.
- `~` : Liquescents
  Example: `(gh~)` is a liquescent podatus (epiphonus)
  TODO: finish this section

Bar lines are notated by punctuation marks.

- `(`)` : virgula
- `(,)` : quarter bar
- `(;)` : half bar
- `(:)` : full barline
- `(::)` : double barlines
  One thing to be careful of regarding barlines – if one occurs at the end of a word, you probably want to ensure that you include a space between the end of the word and typing the barline notation. Otherwise, the Gregorio parser may think the next word after the barline is also part of the previous word, and insert a hyphen between them, which you don't want.
  Example: Note the spacing here – `De(fvED)um(d.) (::) Pa(fg)trem(f)`

As already mentioned, Gregorio tries to intelligently group notes which you've entered into neumes. Sometimes, you will need to mark certain endpoints explicitly.

- `!` : Ends current note grouping, begins the next with **zero** space in between.
  Useful when grouping sets of ascending notes properly; for example to group notes in a scandicus correctly.
- `/` : Same, but inserts a standard space before the next note
- `//` : Same, but inserts a larger space before the next note

4.3 Some final random things which may help

You can specify certain special styles and characters in your chant.

- `*` : inserts a star.
  Example: `*(:)` centers a star under a full barline, while `*()` centers it between two words of the chant if there's no bar
- `+` : inserts a dagger. Use it like the star.
- `(z)` : explicitly ends the current line in the final score and begins a new one
- text : *italics*
- text : **bold**
- <sc>text</sc> : SMALL CAPS
- <v>text</v> : verbatim input - useful for inserting limited TEX; ex. if you need to use the TEX macros for accents
- <tt>text></tt> : `you don't really want this font type in your score, do you?`
- `{a}` : braces are used if you need to explicitly label the letter(vowel) around which the notes should be centered; shouldn't be necessary in most cases
- <sp>V/</sp> shorthand for special chars... these include (incomplete list; I think you can call æ and œ, accented and unaccented, as specials too)
  - `A/` : Ǻ
  - `V/` : V̌
  - `R/` : Ř

There are multiple versions of some of these as well... 𝔙, 𝔚, 𝔛. To use, override the default character mapping in your `main.tex`, or just create new macros for your use. The mapping can be viewed by opening the font file `gresym.pfb` in `fontforge`

TODO: explain this whole section a lot more

```
\def\Vbar{%the default crossed V is mapped to \char 65
{\gregoriansymbolfont \char 78}% so change it to a different character
\relax %
}
```

With a little TEX you can even create your own versions, since the `gresym` font also includes cross bars on their own (kern a bar backwards over a completely different font's V or R, for example, if you want)

`gresym` also includes crosses ✠, ✢, a dagger †, stars * *, and various things you can use for decoration. As an example, the decorative rules dividing this document into sections come from this font.

After all that, here is a complete example (the introit from the Requiem Mass, according to the Traditional Rite):

```
name:Requiem Aeternam;
%%
(c4)RE(ffg)qui(f)em(f) *() æ(f!g'h)tér(hg/gfg)nam(gf..) (;)
dó(f!g'h)na(hg) é(h)is(ixhjHG'hw!ivHG')
Dó(f)mi(fg!hvGF'g)ne:(gf..) (:)
et(hg~) lux(hvGF') per(h)pé(gh)tu(gf)a(f.) (;)
lú(hg)ce(h)at(ixhjHG'hw!ivHG) é(fg!hvGF'g)is.(gf..) <i>Ps.</i>(::)
Te(fg) dé(gf)cet(gh) h<v>\'y</v>m(h)nus(h) Dé(h)us(h) in(h) Sí(g)on,(h.) (;)
et(f) tí(g)bi(h) red(h)dé(h)tur(h)
vó(h)tum(h) in(h) Je(ixg)rú(i)sa(g)lem:(h.) *(:)
e(f)xáu(gh~)di(h) o(h)ra(h)ti(h)ó(h)nem(h) mé(h)am,(h.) (;)
ad(h) te(h) óm(h)nis(h) cá(f)ro(gh) vé(g)ni(f)et.(f.) (::)
Ré(ffg)qui(f)em.(f) (::)
```

Onto creating the pdf!

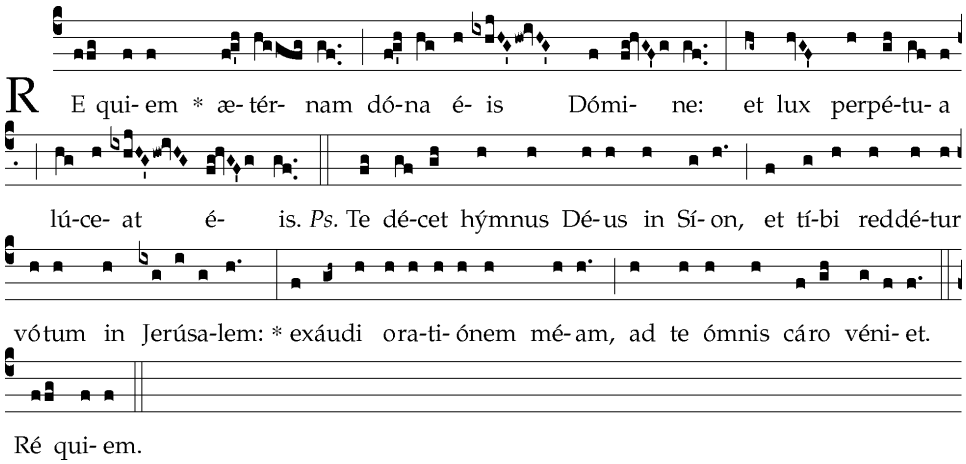
5 Final Touches on the pdf

Okay... so you've got a score. How do we make sure it looks good on the final page? As stated at the beginning, run `gregorio requiemAeternam.gabc`.

Again, create a `main.tex` file. I'll make it pretty bare first, just to look at the score.

```
%% percent signs mark the beginning of comments in .tex files...
\documentclass[12pt, letter]{article} %%sets the document type
\usepackage{fullpage}  %%sets 1in margins
\usepackage{palatino} %%this sets the text font, change it in the usual TeX way
\usepackage[T1]{fontenc} %%font encoding
\usepackage[utf8]{inputenc} %%input encoding
\usepackage{gregoriotex} %%includes gregoriotex.sty. don't change.
\pagestyle{empty} %% suppresses page numbers, header, foooter
\begin{document}
   \includescore{requiemAeternam.tex}
\end{document}
```

Run through `lamed` and `dvipdf`, and here is what it looks like. I apologize if the pictures look odd in your pdf viewer.



Note that the output with the page margins I've set here is not that good, since it breaks between a note and the dot modifying it. Before fixing it, I'll make the beginning initial bigger too. It's controlled by the macro `\greinitialformat` in `gregoriotex.tex`. To change it, redefine that macro in your `main.tex` file (The 'better' LaTeX way is to redefine it in a separate file and call that file in the `main.tex` header, but we'll keep everything in one place for now since it's so simple). So add the new definition before the `\includescore` line.

```
\def\greinitialformat#1{%
{\fontsize{43}{43}\selectfont #1}% first parameter is size, second is leading.
}
```

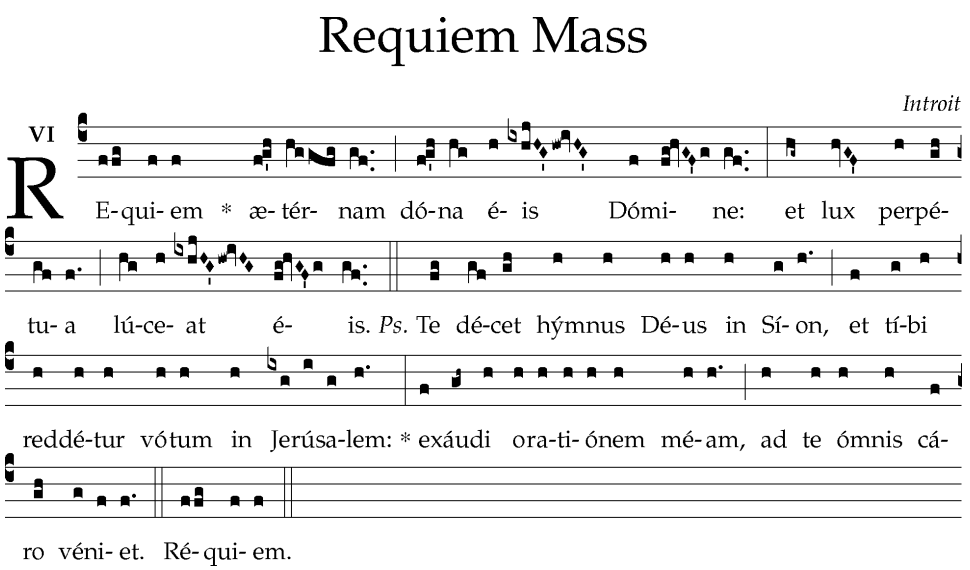
Now to fix the unfortunate line breaking, go back to `.gabc` file and insert a newline `(z)` after the second syllable of perpétua.

The only other thing that needs changing is the missing hyphens in both instances of the word 'Requiem', and in 'caro'. The automatic hyphenation algorithm sometimes fails... So to change that (assuming you don't want to manually edit `requiemAeternam.tex`), go back to `requiemAeternam.gabc` and add them there. Run `gregorio requiemAeternam.gabc` again, and `lamed main.tex` and `dvipdf main.dvi` as well.

Finally, what if you want to add the title, mode, and commentary above the score? The title can be added in `main.tex`, using whatever LaTeX formatting you want. There is a macro `\gregorianmode` in `gregoriotex.tex`; it does not do anything (yet, I assume it will be written at some point). So you can set it manually, also in your main file. Add these lines in your document

```
\begin{center}\begin{huge}Requiem Mass\end{huge}\end{center}
\setfirstlineaboveinitial{\small \textsc{\textbf{VI}}}{\small \textsc{\textbf{VI}}}
\commentary{{\small \emph{Introit}}}
%% this is all taken and modified from the example which comes with gregorio
...
\includescore{requiemAeternam.tex}
```

And that's the general procedure! Process that updated file and the final score looks like this:



6 Buggy Output

Currently, at least in my experience, the output is still a little buggy. For example, sometimes the rhythmic notations get placed incorrectly. Dots can be a space too high or low, or the ictus gets placed on a wrong note in a group. The fa clef seems to reset to a do clef after the first line. This can all be fixed in the GregorioTeX file, assuming you have an idea of how that file is structured. If you really want to understand, most of Gregorio's source code includes detailed comments from the author.

TODO: more details

7 Random Stuff

7.1 Changing the font

Gregorio comes with three different chant fonts

- greciliae : Based on Caeciliae, an OpenType font created by Bro. Matthew Spencer, OSJ. That project is still in development, I believe, if you are interested in a font-based chant notation solution (e.g. the Meinrad fonts).
- gregorio : The developer's creation?
- parmesan : I assume based on lilypond's chant font; they named their fonts after cheese

The default font is greciliae; you can change to one of the other two with `\setgregorianfont{parmesan}` – which needs to be called *inside* a GregorioTeX file – or perhaps easier, remember the heading of the `.gabc` file? You can also include `gregoriotex-font: fontname` as an attribute at the beginning, after `name:`, before the score begins.

Changing the size of the notes in the output score is done with the `\setgrefactor(17)` macro. If you don't use it at all, it gets called automatically with '17' as the default value, which matches the size of notes in the Graduale Romanum; decrease that number for smaller notes or increase for larger.

For text, you change the font type and size in the usual TEX way.

7.2 Changing the initial

As explained above, you can redefine a macro to style the beginning initial any way you want. You can also use macros to eliminate the big initial entirely, or to make it span two lines (useful if you want to use an especially decorative initial).
TODO: explain these; they're in `gregoriotex.tex`

7.3 Empty notes

This requires some (minor) editing of the GregorioTeX file. One bad thing in the output: since the staff lines are drawn first, any empty note you place on a line will have a line through the middlet. You might care, you might not... Anyway, create a score as usual, just putting a 'normal' punctum where you want to use an empty note. Then open the `.tex` file, and look at where that note is. Inside the `\glyph` call for that note, the note should be called as a regular punctum, which is `\char 17` in each of the chant fonts. Change it to `\char 34`. Again, you can open the font `.pfb` files using fontforge if you need to look up the mapping.
Example: This is the beginning of the `RequiemAeternam.tex` file from earlier:

```
\begingregorioscore%
\greinitial{R}%
```

```
\beginscore %
\setinitialclef{c}{4}%
\syllable{}{E}{-}{0}{qu}{i}{0}{}{%
\glyph{\char 17}{f}{f}{0}% <- change the 17 to 34, and it will be an empty note
\endofglyph{0}%
\glyph{\char 1025}{f}{f}{0}%
}%
```

I used this method to create scores for the psalm tones in a Compline booklet, which is a current project I'm working on.

7.4 Translation

You probably don't want to use this yet; the output isn't vertically aligned correctly. But theoretically if you need interlinear latin and vernacular translations, you can set the vernacular text in your `.gabc` file using `[bracketed vernacular text]`.

7.5 External Programs

Maybe you don't really know LaTeX and want to insert your score into a standard word processor. You can use a little ghostscript (or something like ImageMagick... or other things I'm sure) to convert the score from a `.ps` or `.pdf` file to an image, then insert that into, for example, Microsoft Word (wait, can you paste .ps and .pdf files into Word without converting them to images? I actually don't know). Then you can finish your project there. Actually, the scores here are really `.png` images... though this is written in LaTeX, so they would have come out nicer without converting, sorry...

TODO: Possibly add a final section on basic TeX things, for example changing page margins, changing fonts, creating booklets, using parallel columns (ex. for parallel Latin-English); blah blah blah...

8 About this document

This is partly based on information on Gregorio's webpage, as well as information gleaned from its source code, which is all released under GPL.

Okay, so a disclaimer: I really don't know too much about chant! I apologize for any errors in terminology that appear here. Some of the details here may change/become out of date, as Gregorio is still in current development. If you want any LaTeX or .gabc source for anything, or have any questions about this document or errors to point out, please email me at tllenos@gmail.com.